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ABSTRACT

Part of a 13-volume series designed to be used as a group inservice or a self-learning system to train school administrators and counselors for their role in career education, this second section (4.2) of module 4 (Planning) focuses on the involvement of the faculty and staff in financial program planning for shifting resources to coincide with the implementation of career education. (The other three sections of module 4 deal with planning for curriculum infusion, scheduling, and community involvement. Module 4 is one of six modules for administrators and four for counselors developed in Phase IV of a five-phase career education project in Hawaii. The first two are common while the balance are specific to either counselors or administrators.) Module 4.2 contains two lessons and includes a reading section on the purpose of cost analysis. Lesson 1 has two sub-parts, a planning component and a resource shifting component. The planning component relates to the process of identifying resources, determining priorities, and making decisions. The shifting component involves the budget and expenditure plan which are used to achieve priorities and to serve as a fiscal control mechanism. Lesson 2 is structured to help administrators recognize the socio-political ramifications of shifting resources. A bibliography is included. (TA)

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CAREER EDUCATION
ADMINISTRATORS AND COUNSELORS
IMPLEMENTATION MODEL

PHASE IV, HAWAII CAREER DEVELOPMENT CONTINUUM PROJECT

"Comprehensive Staff Development Model for Delivery of Career Development System for the Public Schools of Hawaii"

MODULE IV--PLANNING
(4.2) PLANS FOR RESOURCE ALLOCATION

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

College of Education, University of Hawaii
Office of Instructional Services, Department of Education
State of Hawaii

SEPTEMBER 1976

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PROJECT OVERVIEW

The overall plan for the development of Career Education in the state of Hawaii was conceived as the Hawaii Career Development Continuum Project. To date the continuum consists of the following phases:

PHASE I (1972) - Development of a Continuum for Career Development K-12.

PHASE II (1972-73) - Development of Curriculum Guides K-12 and an ETV series for grades 4-6.

PHASE III (1974-75) - Development of teacher education models and training of teacher cadre, etc.

PHASE IV (1975-76) - Development of model and materials for counselors and administrators.

As can be seen, Phase IV was designated as the training component for administrators and counselors.

The initial segment of Phase IV was to develop a model to characterize the training procedures. The next task was to collect and/or develop a set of materials for each module of the training program. The initial set of materials is designed to present the administrators and counselors an opportunity to seriously examine Career Education and its implications for their institutional roles. The balance of the materials tend to focus on the various administrative functions which affect implementation of Career Education.

The series of documents comprise the materials for an in-service program for a variety of administrative positions at the school and district level. There is a certain flexibility since the materials are designed to be used as a group inservice or a self-learning system.

Program Organization

There are six (6) modules for administrators, four (4) for counselors in the phase. The first two are common while the balance are specific to either counselors or administrators. The modules are:

Module I--Information

Module II--Orientation

Module III--Teacher Information and Orientation for Administrators

3.1 Identify Change Strategy

Module IV--Planning

4.1 Develop Plans for Curriculum Preparation and Infusion

4.2 Plans for Resource Allocation

4.3 Plans for Scheduling

4.4 Plans for Community Involvement

Module V--Implementation

5.1 Supervision of Teaching

5.2 Curriculum Evaluation

Module VI--Evaluation of Career Education (Administrator)

Module VII--Develop and Implement Needs Assessment

Module VIII--Implementation

8.1 Preparation and Evaluation of Counselor Material

8.2 Consultation to School Personnel

8.3 Integration of Coordination of School and Community Resources

Each module has a similar format. A short introduction provides an overview of the material to be covered, and a set of goals which are to be addressed in the module. In the common modules a time frame and a description of the materials are suggested for use with each goal statement.

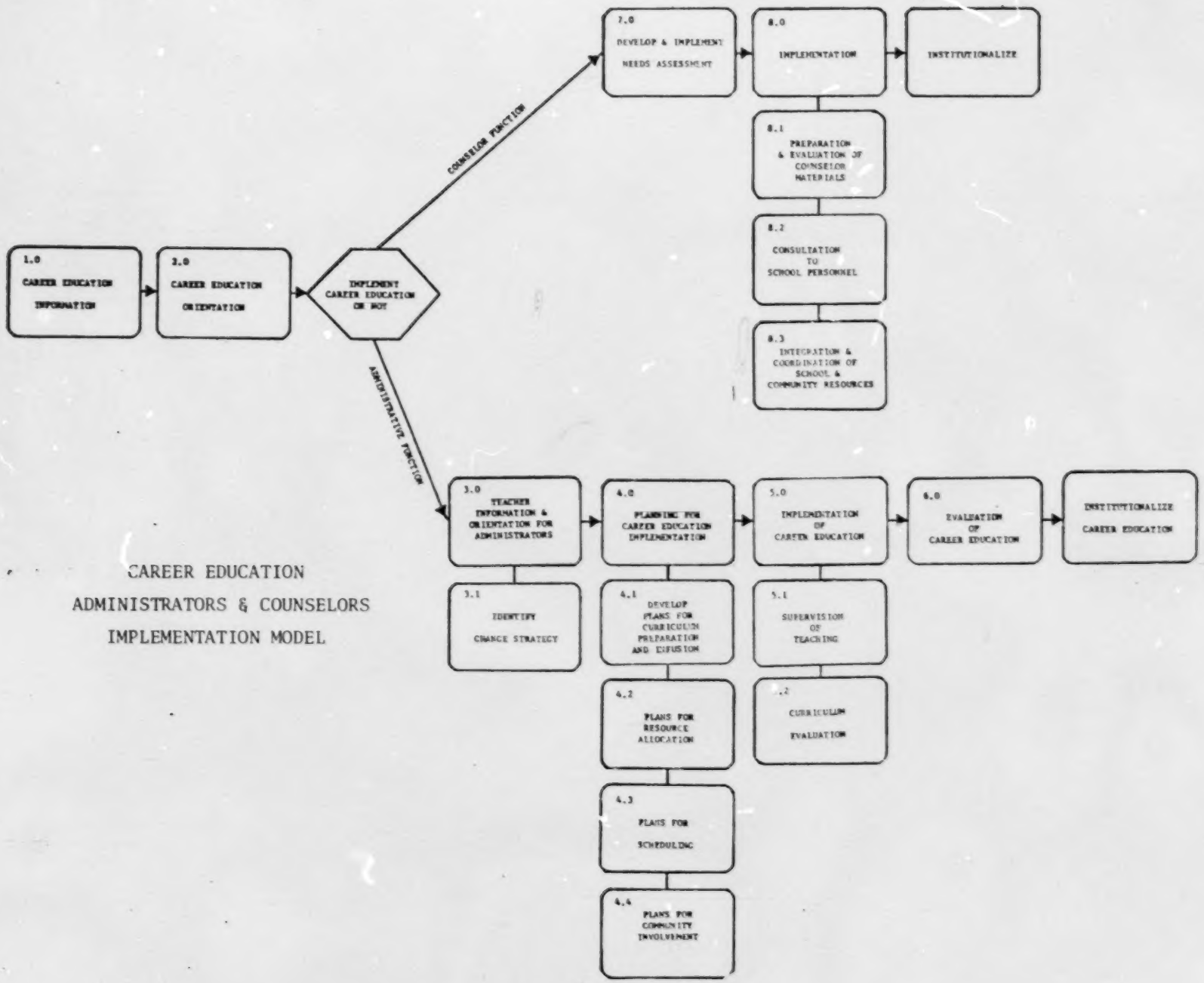
In the administrator and counselor specific modules a lesson format is suggested, since the use of these materials may vary widely from situation to situation.

In addition, there are specific comments for use by a workshop facilitator, instructor, etc., for those lessons where such teaching suggestions are appropriate. Several of the modules contain simulations or other learning activities to reinforce the appropriate goal statement.

Each module has supplementary readings which can be duplicated and handed to the participants either prior to or during the workshop. When there is a time frame for a module, the estimated time has included a period for perusal of the article during the workshop. If the materials are read in advance, the time estimates should be adjusted accordingly. A bibliography is also attached for those modules where it is appropriate.

Again, it should be noted that this set of materials is a guide to training administrators and counselors in the implementation of career education. It is not a prescription which should be followed unwaveringly. Some modules may be inappropriate for certain groups. It is the responsibility of the workshop facilitator to consider the individual differences within and between groups and to gauge the presentations accordingly.

It should further be noted that this implementation program is based upon the notion that there will be a time span between the end of one module and the beginning of the next. Since the entire program would take twenty to thirty hours at a minimum, and given the workshop regulations of the Department of Education, that would be a logical supposition.



CAREER EDUCATION

ADMINISTRATORS & COUNSELORS

IMPLEMENTATION MODEL

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PLANNING MODULE

Plans for Resource Allocation

For the building administrator, the question of resource allocation has a high priority when making the decision on whether or not to implement career education. In this module, resources are broadly defined as both human and fiscal. The budgeting practices of the state of Hawaii and the Department of Education make certain restrictions on the ability of the principal to allocate school resources as he sees fit. These restraints, however, are part of the milieu in which the administrator must function. Thus, the challenges which, in time, will require innovative leadership are enhanced.

Concerns relative to fiscal resources fall into various classes, i.e., mechanisms shifting from resources from current programs to career education, evaluation of the utility function of current expenditures, projections of utility of expenditures for career education materials, interproduce evaluation of various career education materials, the socio-political ramification of moving resources from one program to another. While the examples tend to overlap in some respects, they are discreet enough to serve as benchmarks for analysis.

Although there is uncertainty as to the financial impact that career education will have on a school's budget, there are indicators that increased financial expenditures will be necessary and desirable. The infusion of career education concepts and deliverables into the instructional process does not necessarily mean large increased costs to an instructional budget. Experience does show, however, that initial as well as staff in-service, which provides the readiness for faculty and staff to accept career education and new programs will be required, and there will be a need for providing important financial support. Career exploration and preparation programs at the junior and senior high school levels quite typically demand additional financial resources to provide complete and specialized instructional materials, equipment, and facilities. It is important in the concept of this module that the budget reflect not only the career education activity which is desired in the district, but the financial support which is necessary to provide the desired implementation.

The involvement of the faculty and staff in financial program planning is presented as a strategy in this module. This involvement should be genuine with appropriate direction being given to each individual and a description of his role in the financial planning process communicated so that involvement is effected. A type of feedback communication system which lets those who participate understand what has happened in the financial planning process is also presented as an important administrative task.

The local community is also a source of not only moral and general support for career education, but a source of financial/human resources. The chamber of commerce, business, industry, and labor organizations as well as service clubs are often in a position to provide educational activities. Although such resource contributions may not be shown as hard dollar items in a school budget, they should be shown as representing a solid commitment for support of career education and become a part of the financial program planning process.

Administrators must continue to exercise final judgment and assume responsibility with respect to those aspects of the financial operation of the school under his control. Even with support and control of certain money matters by the D.O.E., the administrator must be prudent and skilled in terms of financial administration.

The commitment of the administration and the district to career education ultimately will be reflected in the budget and the allocation of resources to support the program. An informed commitment to career education should result in financial expenditures which will permit the program to accomplish its important objectives.

Given a sound basis of financial program planning, the final plan should be translated into steps (procedures) for the implementation or operationalization. Steps involving various school personnel, especially department or grade level chairpersons in identifying career education needs, should be included. A method of analysis for these needs and developing a rationale for support of those deemed important should also be accommodated. The ultimate translation of needs into budget items, the priority rating of district needs in terms of final budget items, and the communicating of the budget to the state and hopefully the community for acceptance should be seen as part of the plan. Communicating back to teachers who have been involved in preliminary budget planning should be one of the steps. In summary, the five basic steps that should be included in a minimal plan are: (1) definition of agreed upon objectives, (2) identification of resource needs (both reallocation of existing resources and new resources), (3) priority ranking of resource needs (an administrative act requiring knowledgeable decision makers), (4) allocation of available resources (including those new resources that can be anticipated), and (5) projections of future needs (usually on a five-year basis).

This module has two (2) lessons which examine the goal stated above. After completion the student should:

1. Be able to determine the relative cost utility of programs in the school and to plan for the shifting of resources to coincide with the implementation of career education.

2. Recognize the socio-political ramifications of shifting resources.

Lesson 1

This goal has two sub-parts, a planning component and a resource shifting component. The planning component relates to the process of identifying resources, determining priorities and making decisions. The shifting component involves the budget and expenditure plan which are used to achieve priorities and to serve as a fiscal control mechanism.

Goal 1: To be able to determine the relative cost utility of programs in the school and to plan for the shifting of resources to coincide with the implementation of career education.

Content

For the school level administrator, financial planning in the Department of Education has certain restrictions which tend to somewhat hamper long-range projections, since expenditures for supply items must be carried out on a quarterly spending authority. Likewise there is relatively little flexibility in position counts so the ability to restructure programs through the use of additional personnel is not very realistic. The fairly tight squeeze on the purchase of equipment is also a factor in planning.

These restrictions may be looked upon as barriers to implementation of career education, or as to challenges which therefore require better planning techniques. The fact that thousands of school districts on the mainland have installed career education with financial constraints much more severe than those described above should give strength to the idea that there are challenges to overcome rather than absolute barriers to attempting to install career education.

With regard to supply funds, schools are allotted per pupil sums ranging from $30.00 to $44.00 per year, a sum which compares favorably with school districts on the mainland. Since it appears that in the near future there will be no significant additional funding for career education in Hawaii, it will be necessary for principals to make a very careful analysis of the current expenditures so that the shifting of monies to implement career education programs can occur.

Such analysis must of course include a comparison of budgeted amounts and the actual expenditure of the supply funds. It is not unusual to find expenditures which do not correspond to the budgeted amounts for a given department or grade in a school (assuming this internal budget is established on department or grade level categories). Thus, one must be prepared to use data from both budget and expenditure sources to accurately determine the effect of current supply expenditures.

A second step in the analysis of current expenditure is to assign a utility function to expenditures. For example, a large annual expenditure which benefits a small number of students might be assigned a lower utility value than a

similar expenditure which benefits a larger number of students. How the funds are expended is part of resource allocation and the effect of those expenditures is the other important aspect that principals need to know before beginning to look at the question of shifting resources. A unique method for evaluating utility is presented in the reading by Thomas (1971).

Being placed into a position of having to make decisions on the relative utility of money expenditures vis-a-vis, the missions of the school is not a pleasant experience for the principal. However, in a time where new programs are being demanded by the public and budget increases are not forthcoming from the legislature, the question of utility will become more important.

The reading for this lesson focuses upon cost utility which is one major aspect of analysis in preparation for reallocating resources. The article uses the number of students served by a discipline, teacher costs, space, and supply costs as the input for analysis. Obviously, there are other bases which can be used such as student achievement, relative space, etc. However, each of them have costs attached, so to shift money into career education activities, dollars are a prime measure. In many cases the shift to career education supplies will not necessitate changing money from one department to another, but will involve differing uses of the funds presently alloted to departments. In this case the principal's role is one of monitoring the expenditures to determine the valuative utility of each in relation to the objectives of career education.

To assist the principal to advise in this context, we have devoted a section of the implementation module (See Module V, 5.2) to the evaluation of a number of widely used commercially developed career education materials. The evaluations were made by teachers who are experienced in teaching career education infusion activities in their classes. If a teacher or a department is requesting materials which have not been evaluated, the form which was developed for that purpose will prove valuable as a preliminary screening device.

Principals of feeder schools in a complex should examine the possibility of joint purchase and sharing of certain relatively expensive equipment. Teachers could be requested to coordinate this usage to achieve the greatest utility from the equipment.

If supplies and equipment are used by various grades or departments within a school, a use chart should be maintained. This will give the principal a valuable record of the actual use against the projected and is another post hoc utility measure. If teachers tend to over project usage, the principal can weigh budget request in future years.

Financial Planning

Once an accurate assessment of the current budget and expenditure practices have been determined the mechanism for changing expenditure patterns can be developed.

The development of financial plans for a local education agency must be a team effort which involves all departments and position levels. The budget components cannot be formulated in isolation for any one department or area reflected within it. Many programs encounter difficulty when subordinates only receive a part of the total picture. The budget process necessitates effective communication on two-way basis continously.

Because career education will involve virtually every aspect of the instructional program and all school personnel, the concept of a program budget for career education should be considered desirable. The need to give support to the many and varied thrusts of career education calls for a budget document that will provide sound financial management with minimum possibility that important details in the program will be overlooked. Generally, the existing budget document should be utilized for this lesson so that ideas that are developed can be translated into expenditure plans.

The program budget concept is particularly appropriate for career education expenditures since the program, when installed, will have to be developed over time. The phasing aspect with the concommitant expenditure commitments can be documented as they will provide budget guidelines for the next several years.

Teaching Tips

When a school level administrator is faced with making reallocation decisions, there are any number of alternatives available. The suggestions in this lesson are simply one of the set of possibilities.

A common method of providing funds for career education projects in mainland districts is the mini-grant. The district witholds a portion of the supply budget and offers it to the schools who write grant proposals for a share of the funds. The grants are competitive so each school must have done some innovative planning to be able to qualify for the funds. Generally, a committee of persons well qualified in the concepts of career education are called in to judge the relative merits of the project proposals and recommend to the superintendent those which appear to have the most potential.

A plan such as this could be implemented at the district levels in Hawaii. If the principal suggests this course of action, it would certainly speed the rate of adoption in Hawaii.

Activity 1

A discussion of the administrative tasks of budgeting, allocating resources, and controlling expenditure. Various techniques used by principals and other district level personnel. With the outcome, a set of strategies for shifting resources for use in career education.

Activity 2

Identify the funding requirements necessary to support the various levels of career education in the principal's school. Plan a budget which would enable a school to become fully operational in career education within five years (assuming a 7% per year increase in suppy and equipment funds).

Lesson 2

Goal 2: To recognize the socio-political ramifications of shifting resources.

Content

Whatever change being contemplated must work clearly within the teacher's contractual stipulations. The degree to which change will be produced by the shifting fiscal and personnel resources is difficult to determine. What is certain, however, is that the changes that occur will inevitably lead to other related problems. It is incumbent upon principals and other administrators to anticipate the impact of and prepare the organization and its members for such changes. For example, at the fiscal level, it might mean budgeting for career education equipment, textbooks, and supplies over a period of several years. Obviously this will decrease the amount available for other subject areas, which may cause personnel problems in a school.

Management personnel should be skilled enough or be trained to deal with the many personnel problems that may arise as a result of these changes. They should be fully aware of the elements involved in bringing about a change namely the sociological, psychological, and political aspects of change. Their own views regarding people need to be examined, i.e., role and role perception, needs, and satisfaction of employees.

The curriculum refocus may upset or reclarify roles of leadership and power hierarchy within the teacher's rank. It will take a skillful administrator to work with the changing roles and yet integrate the career education program into the existing school curriculum. The goal essentially should be to change teacher's behavior and not only the curriculum. Sarason makes a distinction between what he calls programmatic (i.e., changes in program only) and behavioral change. This, however, is the most difficult aspect of change and is the most important, for, unless a change in behavior takes place, implementation cannot be successful.

Change agents within the school setting can be the principal, vice principal, counselor, and other teachers. Utilizing a team approach in effecting change may be the most potent and prudent method. The coordinator could be any one of the personnel mentioned above, oftentimes the counselor being the most logical person. The counselor's responsibilities would be to counsel, coordinate and offer consultative services. In addition, the counselor is also a facilitator and resource person.

The negative social and political aspects of resource shifting may be minimized by advanced planning and careful analysis of the probable pitfalls. Planning must include the use of teacher groups to either assist in the resource allocation decisions or to reinforce those made by the principal. A staff committee to assist in shifting resources must be selected with care, for if it does not represent some teachers who are strong supporters of career education, it will be difficult to maintain a change orientation.

Planning should also include an inventory of community resources and project money which may reduce the need for internal shifting. Businesses such as Bell Telephone have developed several kits, audio-visual aids, and other educational materials which can be secured very reasonably (see Module V, 5.2).

It may be necessary to apply economics theories to the analysis of various programs, grade levels, or departments within a school. The cardinal taxing principle of "equal treatment of equals" may be applicable to the distribution of funds in a school. Using the analysis in Thomas (1971) at the end of this module, one can rather quickly calculate the per hour cost for students in various classes, or grade levels. Then the principal and budget committee can levy what is in effect a tax on each department or grade so that the effect is to reduce the per pupil per hour expenditure for all on an equal proportional basis.

The major plus in this type of a decision is that it leaves the existing power bases in a school in the same relative position as before. Therefore, competition for increased funding will come through the career education money; a more desirable state of affairs.

The major emphasis in this lesson is for the principal to determine whether or not it is desirable to change the base of power vis-a-vis resource allocation. If not, the decision must be to structure the career education so that departments who presently have relatively sufficient resources are those who are also the first to implement the new programs.

Part of the analysis of resource allocation or reallocation is to recognize that the curriculum reforms which affect money also affect the informal relationship within the school. Providing for these potential problems is part of the decision-making process which the principal must be involved. Advance planning and thought can minimize the dislocations which could be caused and at the same time make the program operate more effectively.

Teaching Tips

Addressing the problem suggested in this lesson is not an easy task for the trainer. There will perhaps be a certain reticence among school level administrators to admitting that certain internal, unofficial power hierarchies exist. This may be particularly true in elementary schools where the teacher groups tend to be tightly knit. However, it is a concern which is rightly addressed as part of the aspect of resource allocation whether it be the reassigning of a teacher assistant to classes who are involved in career education, or the redistribution of supply funds.

The openness of the climate of the school will have an effect on the trauma associated with reallocation of resources. Some principals may not be able to make a rational determination of the climate in their school. There are instruments available to give the principal feedback in that areas. The "Organizational Climate Description Questionnaire" is one example which could be suggested. This instrument has a number of subscales, which, when added together, give a fairly valid description of the climate in the school. If a principal is interested in first making such assessment, he can receive assistance from the Department of Educational Administration at the University of Hawaii.

Activity 1

Set up a simulation involving the principal and the department (grade level) chairperson who is going to have his supply budget cut so that additional funds can be funneled into career education. Have the principal address the question of the utility function which may prompt such a shift in allocation.

The purpose of the simulation is to allow other principals to pick up tips and to offer ideas on how best to accomplish this unpleasant task.

Activity 2

Set up a similar situation as Activity 1 with a teacher who is having an educational assistant who has been working for reassignment to a career education function.

READING

PURPOSE OF COST ANALYSIS
from The Productive School:
A Systems Analysis Approach to Educational Administration

by J. Alan Thomas

The Organizational Context of Cost Analysis

Let us first consider the question of organizational context. It may be stated as a general principle that the lower one is in the organizational hierarchy, the more his decisions will involve allocating time rather than money.

1. At the school district level, there will be a concern for the costs associated with the purchase of goods and services. As part of their responsibility for operating an efficient educational system, school board members and the school superintendent may study the monetary costs of operating a given school, or of providing a given type of program. There is typically much less concern with the manner in which the input, once purchased, is used. This type of problem is left, in part at least, to the school principal.

2. To the extent that each school principal has control over the budget of his school, some costs at the school level will be expressed in monetary terms. However, many school principals do not have their own budget, and the major resource under their control is the time of teachers and students. Decisions concerning the deployment of personnel involve costs, which must be evaluated in terms of foregone opportunities to use this time in other ways.

3. Within each classroom, the teacher is a decision maker who determines, among other things, how students' time and her own time as well shall be used. Teachers sometimes have control over petty amounts of cash, including some money raised outside the regular budget, but the major costs that teachers take into consideration in their decision making are foregone opportunities to use time in other ways.

4. Students also deal with opportunity costs; when they are given some discretion over the way in which they spend their time. Some secondary schools and all universities force a kind of cost analysis on students by requiring them to decide how they will divide their time among the various subjects on the curriculum. Time is by far the most important resource which is subject to the control of students.

In each of these contexts, it is assumed that resources should be allocated so as to maximize the achievement of a given objective or set of objectives. Cost analysis provides a means for examining the manner in which resources are used. The data may therefore give evidence concerning the rationality of the organization. However, monetary costs are not always subject to administrative

control and are not always identical with foregone opportunities. Variations in prices of inputs, including teachers' salaries, may affect costs. Costs may also be determined in part by the amount of money which is available. For example, teacher salary agreements are often affected by the level of financial support provided by the state legislature. Finally, the allocation of resources to meet a given set of objectives may be an ambiguous criterion of rationality, since the objectives themselves may be partially determined by the amount of resources available. At any rate, it is important to develop procedures for costs analysis in education. Some aspects of these procedures are described below.

Elements of Unit Cost. Cost differences may result from many factors, including the quality of services provided and the price paid for inputs. Also, they may be due to differences in the mix of outputs provided by educational systems. Systems with a more expensive output mix may for this reason show high costs.

Table 1 illustrates how differences in the output mix may affect the total cost of operating a school. The table compares two hypothetical schools of 1000 students each. Students in each school register for 5 courses each, for a total of 180 hours in each course.

The differences in total cost between the two schools are due to differences in output mix. School B has more students enrolled in the more expensive courses (woodworking, homemaking, and business), while school A has most of its students enrolled in the less expensive, academic types of courses. It would therefore be misleading to compare the per pupil costs in the two schools ($365.40 as opposed to $380.70) without including in the comparison a statement concerning the differences in the product mix of the two schools.

Also, expenditure comparisons are based on very gross units of time. School years and school days vary in length from system to system; therefore a measure of costs on an annual and daily basis would be misleading. Comparative data should be based on comparative time units. The best unit is therefore the cost per student hour for a specific service.

In determining the direct cost of a student hour of a given service, the following element must be considered.

Teacher's salary
Other salaries
Space
Equipment and materials

On the basis of these factors, we present the following example of unit cost analysis.

Consider the components of the cost per student hour of a course in Biology I. We must include the costs of the time of teachers and other personnel of space, equipment, and books. We will assume that the knowledge of subject matter upon which the course is based does not represent a cost to the school. The school, however, must bear the costs of books and of the services of a teacher who has mastered the knowledge which the course contains.

Table 1

Differences in Output Mix in Two Hypothetical Schools
(Assume Identical Cost per Student Hour in Schools A and B)

Subject	Course Enrollment		Cost per Student Hour	Total Cost (Cost per Student Hour × 180 × Enrollment)	
	School A	School B		School A	School B
English	1000	1000	0.35	$ 63,000	$ 63,000
Mathematics	600	400	0.35	37,800	25,200
Phys. Educ.	1000	1000	0.50	90,000	90,000
French	500	200	0.35	31,500	12,600
Woodworking	200	400	0.60	21,600	43,200
Shop	100	400	0.50	9,000	36,000
Science	500	300	0.45	40,500	24,300
Business	300	500	0.40	21,600	36,000
Soc. Studies	800	800	0.35	50,400	50,400
Total	5000	5000		$365,400	$380,700

1. Teacher's time. If there are other people such as the chairman of the science department or science consultants who share the task of providing instruction in biology, we must include the costs of their time. If the teachers' task is defined as including preparation for classes, grading paper, and setting up experiments, this time should also be charged against the teacher's inputs.

   Assume that the teacher's salary is $8,000, and that she is assisted by supporting personnel to the extent of another $1,000 in salary. Assume that this teacher teaches a total of 120 students, each for 180 hours in the school year. Then the cost per student hour for teachers' services in Biology I is $0.42.

2. Administrator's time. One important administrative function is to improve the quality of educational services. Hence, part of the time of administrators should be prorated among the subject matter areas. We will assume, in our example, that the costs of providing clerical assistance and administrators' time are included in the time of supporting personnel reported in 1.

3. Space. Scheduling is one of the central roles of the administrator, since it is directly related to facilitating teaching and learning, and since it involves the allocation of key resources--time of students, time of teachers, space and equipment. The administrator must have some knowledge of the relative cost of resources if he is to use them productively. However, educators often pay insufficient attention to the cost of space. The concern in public administration generally is for out-of-pocket expenditures rather than for the economic cost of resource inputs.

   There are five components to the cost of classroom space. The first is the interest on unpaid debt. The second is the economic cost of the equity, or the interest this equity would produce if it were invested elsewhere. The third is depreciation--the annual decrease in value due to the aging of the building. Fourth is the overhead associated with space--heat, light, and power. Fifth is the cost of maintenance. For comparative purposes, consider the cost of home ownership to a family who owns a house which originally cost $20,000.00. Assume that at a given point in time, the family has a mortgage for $8,000.00 but that, due to depreciation, the value of the house is now $16,000.00. The cost of home ownership includes the following components:

(a) Interest on the mortgage. Say 4% of $8000	$ 320
(b) Imputed interest on the equity. Say 5% of $8000. This amount is the amount which the equity would bring if it were invested elsewhere--assuming a going rate of interest of 5%.	400
(c) Depreciation. Assume an additional expected life of 25 years ($16,000/25)	640

(d) Taxes, Say	$ 640
(d) Maintenance. Say	400
(f) Overhead (light, heat, power). Say	600
Total cost of space	$3000

Now let us cost out the space of the laboratory facilities for Biology I.

Assume a biology laboratory containing 1200 square feet. Assume another 25 percent of this space (300 square feet) for supporting space (corridors, etc.). Let the cost of construction be $16 per square foot, making a total cost of $24,000. Assume further that the present value (after depreciation) is $20,000, of which $15,000 is still owing. The cost of this space may be calculated as follows:

(a) Interest on debentures. Say 4% of $15,000	$ 600
(b) Imputed interest on equity. Say 5% of $5000	250
(c) Depreciation. Assume additional expected life of 20 years	1000
(d) Maintenance. Say	400
(e) Overhead (light, power, heat). Say	400
Total cost	$2650

This cost is for say 120 students for 180 hours each, making a per student-hour cost of $0.12.

4. Equipment. Assume that the biology laboratory is equipped to the value of $10,000, all of which has been paid. The cost can be calculated as follows:

(a) Imputed interest 5% of $10,000	$ 500
(b) Maintenance. Say	100
(c) Depreciation. Assume additional expected life of 10 years.	1000
Total	$1600

which comes to $0.06 per student hours.

5. Materials, totalling say, $0.02 per student hours. Thus, to recapitulate, the cost per student hour is as follows:

Personnel	$0.42
Equipment	0.06
Space	0.12
Material	0.02
Total	$0.62

Variations in Output Mix

In this section, we turn to the problems which are involved when programs are combined to form a comprehensive educational curriculum.

We will refer to the aggregation of programs as an "output mix." We can discuss the output mix for a school, or for an individual student who studies, say, five courses, for an hour each, every day. Since the costs per student-hour vary among programs, they will also vary from school to school, in cases where there are differences in enrollments among subject areas. Referring back to the hypothetical costs of Table 1, we now compare costs per day for two students (Table 2).

Our discussion of the relationship between size of school and cost per student hour in a given program must now be broadened. As the size of schools increases, schools tend to offer a greater variety of courses. There are several reasons for this tendency. In the first place, it requires a relatively large total number of students to produce enough individuals who are interested in and qualified for such courses as a second or a third language, advanced placement physics, or electronics, to make such a course possible. In the second place, large size is usually, although not necessarily, accompanied by heterogeneity in the total student body, so that a more diversified curriculum is called for.

We are now in a position to present a proposition which is testable, and which provides one means of studying the effect of the size of a school on the economics of its operation. The proposition is as follows:

1. As the size of a school increases, certain economies in terms of the cost per hour of a given program are made possible. These economies may be studied by the analytic means outlined above. They are related, primarily, to (a) indivisibilities; and (b) specialization and division of labor.

2. As the size of a school increases, there is a tendency for the output mix to change in the following ways. (a) It becomes broader, encompassing a greater total number of programs. (b) It includes a greater emphasis on the more costly courses, which require either expensive equipment and space, or the services of highly trained specialist teachers.

3. On an aggregate basis, changes in the output mix tend to obscure the economies of scale. In other words, these economies are used to finance a more diversified program, which includes greater enrollments in more costly program areas.

Indivisibilities. Even if it were desirable to do so, it would not be possible to increase inputs in exactly the same proportion as outputs are increased. This is because inputs come as discrete units, and not as infinitely divisible quantities.

Units of space provide one example of the indivisibility of inputs. Consider a one room school, built for 30 students. It is impossible to add a third of a classroom when the enrollment increases to 40. Rather, an entire new classroom

Table 2

Hypothetical Costs per Day for Two Students

Student A's Program	Cost per Hour	Student B's Program	Cost per Hour
English	$0.35	English	$0.35
Mathematics	0.35	Social Studies	0.35
Social Studies	0.35	Physical Education	0.50
Physical Education	0.50	Homemaking	0.50
French	0.35	Business	0.40
Cost per five hour day	$1.90		$2.10

Note: Costs will also be higher when a student enrolls for more than five courses. Hence, within a given school, we may expect input variations among students as the output mix changes.

must be added, with a total space for 60 students (if the 30-student size is maintained). In the case of a large secondary school, it is not feasible to add a single classroom. Rather, if an addition is built to the school, it must for the sake of practiciality be a section consisting of a number of classrooms and supporting services such as light and heat. (One exception to this rule is the use of mobile classrooms, which permit adding one room at a time to even the largest schools.) Other space units, such as cafeterias, auditoriums and libraries, are, to an even greater extent than classrooms, all-or-nothing aspects of the total school plant; it is impossible, for example, to add to the library a few square feet at a time as the school's enrollment grows.

People, also, are indivisible. It is impossible to add continuously to the staff to keep up with growing enrollment. That is to say, we cannot add half an English teacher when the enrollment in English increases by only 15 students (unless the teacher is hired half time, or shared with another school; possibilities which are sometimes, but not always, feasible). Other personnel are even better examples of the phenomenon of indivisibility--for example, the principal, librarian, deans, and engineer.

Indivisibilities are integrally related to increasing returns to scale. As inputs, in the form of space, personnel, or equipment are added to a school, it pays to use them to the maximum. Hence, given a certain set of inputs, the cost per student hour of output decreases as these inputs are used more and more intensively. For example, a school may be planned to serve an ultimate school population of 2500 students. Although the first wing which is built will accommodate only, say, 1000 students, it is desirable to build certain facilities (for example, offices, library, and cafeteria) for the total student body, since these facilities cannot easily be expanded. As the student body increases in size, the cost per student of this space will decrease. Any school must have a principal; a school of 1000 students will no doubt need the services of a full-time principal. However, as the size of the school increases to 2500 students, it is not necessary to appoint a second principal. It may be that an initial half-time assistant principalship may change to a full time position; however, the increase in number of hours of administrative services required is proportionately less than the increase in student output-hours.

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